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EXAMINER	
THOMAS, BRANDI N	
ART UNIT	**PAPER NUMBER**
2873	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/660,626	WANG ET AL.	
	Examiner	Art Unit	
	Brandi N Thomas	2873	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _16 August 2004_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-57_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-57_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _12 September 2003_ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _9/12/03_.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☒ Other: _Detailed Action_.

DETAILED ACTION

Election/Restrictions

1. Restriction to claims 1-57 have been withdrawn based upon applicant's arguments on page (s) 2-4. The examiner considers the claims now examined to be an original presentation. Any other embodiments or invention may be subject to election by original presentation.

Information Disclosure Statement

2. Acknowledgement is made of receipt of Information Disclosure Statement(s) (PTO-1449) filed 9/12/03. An initialed copy is attached to this Office Action.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huibers et al. (6741383 B2) in view of Chinn et al. (US 2004/0033639 A1).

Regarding claim 1, Huibers et al. discloses, in figures 4 and 5A-5C, a method of preventing peeling between two silicon layers, comprising the steps of: providing a first layer (512) having a first silicon material (col. 9, lines 4-5); forming a second layer (514) having a first silicon material (col. 9, lines 10-14); except that it does not show performing a hydrogen

treatment on the first layer. Chinn et al. shows that it is known to performing a hydrogen treatment on the layer for creating bonded hydroxyl groups on to remove residues (section 0099). Therefore it would have been obvious to someone of ordinary skill in the art at the time the invention was made to combine the method of Huibers et al. with the hydrogen treatment of Chinn et al. for the purpose of creating bonded hydroxyl groups on to remove residues (section 0099).

Regarding claim 2, Huibers et al. discloses a method of preventing peeling between two silicon layers, wherein the first silicon material (512) is an amorphous silicon layer or a crystalline silicon layer (col. 8, lines 46-52).

Regarding claim 3, Huibers et al. discloses a method of preventing peeling between two silicon layers, wherein the second silicon material (512) is an amorphous silicon layer or a crystalline silicon layer (col. 8, lines 46-52).

Regarding claim 4, Chinn et al. discloses a method of preventing peeling between two silicon layers, wherein the hydrogen treatment is a hydrogen plasma treatment (section 0099).

Regarding claim 5, Chinn et al. discloses a method of preventing peeling between two silicon layers, including an RF power, a hydrogen gas flow, an operating temperature, an operating time, and an operating pressure except for the operational conditions of the hydrogen plasma treatment comprise an RF power of 50~300 Watts, a hydrogen gas f low of 200~2000 sccm, an operating temperature of 300~400 ^{0}C, an operating time of 30-90sec and an operating pressure of 0.l~10 torr. It would have been obvious to modify the hydrogen plasma treatment to include an RF power of 50~300 Watts, a hydrogen gas f low of 200~2000 sccm, an operating temperature of 300~400 ^{0}C, an operating time of 30-90sec and an operating pressure of 0.l~10

torr, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 233). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the hydrogen plasma treatment to include an RF power of 50~300 Watts, a hydrogen gas f low of 200~2000 sccm, an operating temperature of 300~400 ^{0}C, an operating time of 30-90sec and an operating pressure of 0.1~10 torr for the purpose of defining a plasma processing system suitable for treatment of the hydrogen (sections 0068, 0082, and 0093).

Regarding claim 6, Chinn et al. discloses a method of preventing peeling between two silicon layers, including an RF power, a hydrogen gas flow, an operating temperature, an operating time, and an operating pressure except for the operational conditions of the hydrogen plasma treatment comprise an RF power of 200 Watts, a hydrogen gas f low of 600 sccm, an operating temperature of 320 ^{0}C, an operating time of 60 sec and an operating pressure of 0.8 torr. It would have been obvious to modify the hydrogen plasma treatment to include an RF power of 200 Watts, a hydrogen gas f low of 600 sccm, an operating temperature of 320 ^{0}C, an operating time of 60 sec and an operating pressure of 0.8 torr, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980)). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the hydrogen plasma treatment to include an RF power of 200 Watts, a hydrogen gas f low of 600 sccm, an operating temperature of 320 ^{0}C, an operating time of 60 sec and an operating pressure

of 0.8 torr for the purpose of defining a plasma processing system suitable for treatment of the hydrogen (sections 0068, 0082, and 0093).

Regarding claim 7, Chinn et al. discloses a method of preventing peeling between two silicon layers, wherein the hydrogen treatment is an HF vapor treatment (sections 0075 and 0099).

Regarding claim 8, Chinn et al. discloses a method of preventing peeling between two silicon layers, wherein the HF vapor used HF (49wt%) with a ratio of H_2O: HF = 30:1 ~ 70:1 (section 0076).

Regarding claim 9, Chinn et al. discloses a method of preventing peeling between two silicon layers, wherein hydrogen plasma treatment and the formation of the second layer are preformed in the same processing chamber (section 0099).

Regarding claim 10, Huibers et al. discloses, in figures 4 and 5A-5C, a method of preventing peeling between two silicon layers in the microelectromechanical structure (MEMS) process, comprising the steps of: providing a first layer having a first silicon layer (512) (col. 9, lines 4-5); forming a second layer (514) having a second silicon material on the H-treated silicon surface (col. 9, lines 10-14) except that it does not show performing a hydrogen treatment on the first sacrificial silicon layer to form an H-treated silicon surface thereon. Chinn et al. shows that it is known for performing a hydrogen treatment on the first sacrificial silicon layer to form an H-treated silicon surface thereon for creating bonded hydroxyl groups on to remove residues (section 0099). Therefore it would have been obvious to someone of ordinary skill in the art at the time the invention was made to combine the method of Huibers et al. with the hydrogen

treatment of Chinn et al. for the purpose of creating bonded hydroxyl groups on to remove residues (section 0099).

Regarding claim 11, Huibers et al. discloses a method of preventing peeling between two silicon layers in the microelectromechanical structure (MEMS) process, wherein the first silicon material (512) is an amorphous silicon layer or a crystalline silicon layer (col. 8, lines 46-52).

Regarding claim 12, Huibers et al. discloses a method of preventing peeling between two silicon layers in the microelectromechanical structure (MEMS) process, wherein the second silicon material (512) is an amorphous silicon layer or a crystalline silicon layer (col. 8, lines 46-52).

Regarding claim 13, Chinn et al. discloses a method of preventing peeling between two silicon layers in the microelectromechanical structure (MEMS) process, wherein the second sacrificial silicon layer (514) is formed by CVD using SiH_4 as a reaction gas (section 0075).

Regarding claim 14, Chinn et al. discloses a method of preventing peeling between two silicon layers in the microelectromechanical structure (MEMS) process, wherein the hydrogen treatment is a hydrogen plasma treatment (section 0099).

Regarding claim 15, Chinn et al. discloses a method of preventing peeling between two silicon layers in the microelectromechanical structure (MEMS) process, including an RF power, a hydrogen gas flow, an operating temperature, an operating time, and an operating pressure except for the operational conditions of the hydrogen plasma treatment comprise an RF power of 50~300 Watts, a hydrogen gas f low of 200~2000 sccm, an operating temperature of 300~400 ^{0}C, an operating time of 30-90sec and an operating pressure of 0.1~10 torr. It would have been obvious to modify the hydrogen plasma treatment to include an RF power of 50~300 Watts, a

hydrogen gas f low of 200~2000 sccm, an operating temperature of 300~400 ^{0}C, an operating time of 30-90sec and an operating pressure of 0.1~10 torr, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 233). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the hydrogen plasma treatment to include an RF power of 50~300 Watts, a hydrogen gas f low of 200~2000 sccm, an operating temperature of 300~400 ^{0}C, an operating time of 30-90sec and an operating pressure of 0.1~10 torr for the purpose of defining a plasma processing system suitable for treatment of the hydrogen (sections 0068, 0082, and 0093).

Regarding claim 16, Chinn et al. discloses a method of preventing peeling between two silicon layers in the microelectromechanical structure (MEMS) process, including an RF power, a hydrogen gas flow, an operating temperature, an operating time, and an operating pressure except for the operational conditions of the hydrogen plasma treatment comprise an RF power of 200 Watts, a hydrogen gas f low of 600 sccm, an operating temperature of 320 ^{0}C, an operating time of 60 sec and an operating pressure of 0.8 torr. It would have been obvious to modify the hydrogen plasma treatment to include an RF power of 200 Watts, a hydrogen gas f low of 600 sccm, an operating temperature of 320 ^{0}C, an operating time of 60 sec and an operating pressure of 0.8 torr, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980)). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the hydrogen plasma treatment to include an RF power of 200 Watts, a hydrogen gas f low of 600 sccm, an operating temperature of 320 ^{0}C, an operating time

of 60 sec and an operating pressure of 0.8 torr for the purpose of defining a plasma processing system suitable for treatment of the hydrogen (sections 0068, 0082, and 0093).

Regarding claim 17, Chinn et al. discloses a method of preventing peeling between two silicon layers in the microelectromechanical structure (MEMS) process, wherein the hydrogen treatment is an HF vapor treatment (sections 0075 and 0099).

Regarding claim 18, Chinn et al. discloses a method of preventing peeling between two silicon layers in the microelectromechanical structure (MEMS) process, wherein the HF vapor used HF (49wt%) with a ratio of H_2O: HF = 30:1 ~ 70:1 (section 0076).

Regarding claim 19, Chinn et al. discloses a method of preventing peeling between two silicon layers in the microelectromechanical structure (MEMS) process, wherein hydrogen plasma treatment and the formation of the second layer are preformed in the same processing chamber (section 0099).

Regarding claim 20, Huibers et al. discloses, in figures 4 and 5A-5C, a method of forming a micromechanical structure, comprising the steps of: providing at least one micromechanical structural layer above a substrate (511), the micromechanical structural layer being sustained between a lower sacrificial silicon layer (512) (col. 9, lines 4-5) and an upper sacrificial silicon layer (514) (col. 9, lines 10-14); and removing the upper and lower sacrificial layer (512 and 514) except that it does not show a H-treated silicon surface. Chinn et al. shows that it is known to provide an inert gas sputtering on the mirror plate and the first sacrificial silicon layer; performing a hydrogen treatment on the first sacrificial silicon layer to form an H-treated silicon surface thereon for creating bonded hydroxyl groups on to remove residues (section 0099). Therefore it would have been obvious to someone of ordinary skill in the art at

the time the invention was made to combine the method of Huibers et al. with the inert gas and hydrogen treatment of Chinn et al. for the purpose of creating bonded hydroxyl groups on to remove residues (section 0099).

Regarding claim 21, Huibers et al. discloses a method of forming a micromechanical structure, wherein the first silicon material (512) is an amorphous silicon layer or a crystalline silicon layer (col. 8, lines 46-52).

Regarding claim 22, Huibers et al. discloses a method of forming a micromechanical structure, wherein the second silicon material (512) is an amorphous silicon layer or a crystalline silicon layer (col. 8, lines 46-52).

Regarding claim 23, Chinn et al. discloses a method of forming a micromechanical structure, wherein the second sacrificial silicon layer (514) is formed by CVD using SiH_4 as a reaction gas (section 0075).

Regarding claim 24, Chinn et al. discloses a method of forming a micromechanical structure, wherein the hydrogen treatment is a hydrogen plasma treatment (section 0099).

Regarding claim 25, Chinn et al. discloses a method of forming a micromechanical structure, including an RF power, a hydrogen gas flow, an operating temperature, an operating time, and an operating pressure except for the operational conditions of the hydrogen plasma treatment comprise an RF power of 50~300 Watts, a hydrogen gas f low of 200~2000 sccm, an operating temperature of 300~400 ^{0}C, an operating time of 30-90sec and an operating pressure of 0.1~10 torr. It would have been obvious to modify the hydrogen plasma treatment to include an RF power of 50~300 Watts, a hydrogen gas f low of 200~2000 sccm, an operating temperature of 300~400 ^{0}C, an operating time of 30-90sec and an operating pressure of 0.1~10 torr, since it

has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 233). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the hydrogen plasma treatment to include an RF power of 50~300 Watts, a hydrogen gas f low of 200~2000 sccm, an operating temperature of 300~400 ^{0}C, an operating time of 30-90sec and an operating pressure of 0.1~10 torr for the purpose of defining a plasma processing system suitable for treatment of the hydrogen (sections 0068, 0082, and 0093).

Regarding claim 26, Chinn et al. discloses a method of forming a micromechanical structure, including an RF power, a hydrogen gas flow, an operating temperature, an operating time, and an operating pressure except for the operational conditions of the hydrogen plasma treatment comprise an RF power of 200 Watts, a hydrogen gas f low of 600 sccm, an operating temperature of 320 ^{0}C, an operating time of 60 sec and an operating pressure of 0.8 torr. It would have been obvious to modify the hydrogen plasma treatment to include an RF power of 200 Watts, a hydrogen gas f low of 600 sccm, an operating temperature of 320 ^{0}C, an operating time of 60 sec and an operating pressure of 0.8 torr, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980)). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the hydrogen plasma treatment to include an RF power of 200 Watts, a hydrogen gas f low of 600 sccm, an operating temperature of 320 ^{0}C, an operating time of 60 sec and an operating pressure of 0.8

torr for the purpose of defining a plasma processing system suitable for treatment of the hydrogen (sections 0068, 0082, and 0093).

Regarding claim 27, Chinn et al. discloses a method of forming a micromechanical structure, wherein the hydrogen treatment is an HF vapor treatment (sections 0075 and 0099).

Regarding claim 28, Chinn et al. discloses a method of forming a micromechanical structure, wherein the HF vapor used HF (49wt%) with a ratio of H_2O: HF = 30:1 ~ 70:1 (section 0076).

Regarding claim 29, Chinn et al. discloses a method of forming a micromechanical structure, wherein the H-treated surface has Si-H bonds (section 0099).

Regarding claim 30, Huibers et al. discloses, in figures 4 and 5A-5C, a method of forming a micromirror structure, comprising the steps of: forming a first sacrificial silicon layer (512) on a substrate (511) (col. 9, lines 4-5); forming a mirror plate (513) on part of the first sacrificial silicon layer (512) (col. 8, lines 53-54 and col. 9, line 5); forming a second sacrificial silicon layer (514) over the mirror plate (513) and the first sacrificial silicon layer (512) (col. 9, lines 10-14); forming at least one hole (516 and 518) penetrating the second sacrificial silicon layer (514), the mirror plate (513) and the first sacrificial silicon layer (512) (col. 9, lines 23-27); filling a conductive material in the hole (516 and 518) to define a mirror support structure (515) attached to the mirror plate (513) and the substrate (511) (col. 9, lines 36-42); and removing the first and second sacrificial layers (512 and 514) to release the mirror plate (513) (col. 9, lines 40-45) except that it does not show performing an inert gas sputtering on the mirror plate and the first sacrificial silicon layer; performing a hydrogen treatment on the first sacrificial silicon layer to form an H-treated silicon surface thereon. Chinn et al. shows that it is known to provide an

inert gas sputtering on the mirror plate and the first sacrificial silicon layer; performing a hydrogen treatment on the first sacrificial silicon layer to form an H-treated silicon surface thereon for creating bonded hydroxyl groups on to remove residues (section 0099). Therefore it would have been obvious to someone of ordinary skill in the art at the time the invention was made to combine the method of Huibers et al. with the inert gas and hydrogen treatment of Chinn et al. for the purpose of creating bonded hydroxyl groups on to remove residues (section 0099).

Regarding claim 31, Huibers et al. discloses a method of forming a micromirror structure, wherein the substrate (511) is a glass or quartz substrate (col. 8, lines 40-45).

Regarding claim 32, Huibers et al. discloses a method of forming a micromirror structure, wherein the first sacrificial layer (512) is an amorphous silicon layer or a crystalline silicon layer (col. 8, lines 46-52).

Regarding claim 33, Huibers et al. discloses a method of forming a micromirror structure, wherein the second sacrificial silicon layer (514) is an amorphous silicon layer or a crystalline silicon layer (col. 9, lines 10-14).

Regarding claim 34, Chinn et al. discloses a method of forming a micromirror structure, wherein the second sacrificial silicon layer (514) is formed by CVD using SiH_4 as a reaction gas (section 0075).

Regarding claim 35, Chinn et al. discloses a method of forming a micromirror structure, wherein the inert gas sputtering is argon sputtering (section 0015).

Regarding claim 36, Chinn et al. discloses a method of forming a micromirror structure, wherein the hydrogen treatment is a hydrogen plasma treatment (section 0099).

Regarding claim 37, Chinn et al. discloses a method of forming a micromirror structure, including an RF power, a hydrogen gas flow, an operating temperature, an operating time, and an operating pressure except for the operational conditions of the hydrogen plasma treatment comprise an RF power of 50~300 Watts, a hydrogen gas f low of 200~2000 sccm, an operating temperature of 300~400 ^{0}C, an operating time of 30-90sec and an operating pressure of 0.1~10 torr. It would have been obvious to modify the hydrogen plasma treatment to include an RF power of 50~300 Watts, a hydrogen gas f low of 200~2000 sccm, an operating temperature of 300~400 ^{0}C, an operating time of 30-90sec and an operating pressure of 0.1~10 torr, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 233). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the hydrogen plasma treatment to include an RF power of 50~300 Watts, a hydrogen gas f low of 200~2000 sccm, an operating temperature of 300~400 ^{0}C, an operating time of 30-90sec and an operating pressure of 0.1~10 torr for the purpose of defining a plasma processing system suitable for treatment of the hydrogen (sections 0068, 0082, and 0093).

Regarding claim 38, Chinn et al. discloses a method of forming a micromirror structure, including an RF power, a hydrogen gas flow, an operating temperature, an operating time, and an operating pressure except for the operational conditions of the hydrogen plasma treatment comprise an RF power of 200 Watts, a hydrogen gas f low of 600 sccm, an operating temperature of 320 ^{0}C, an operating time of 60 sec and an operating pressure of 0.8 torr. It would have been obvious to modify the hydrogen plasma treatment to include an RF power of 200

Watts, a hydrogen gas f low of 600 sccm, an operating temperature of 320 ^{0}C, an operating time of 60 sec and an operating pressure of 0.8 torr, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980)). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the hydrogen plasma treatment to include an RF power of 200 Watts, a hydrogen gas f low of 600 sccm, an operating temperature of 320 ^{0}C, an operating time of 60 sec and an operating pressure of 0.8 torr for the purpose of defining a plasma processing system suitable for treatment of the hydrogen (sections 0068, 0082, and 0093).

Regarding claim 39, Chinn et al. discloses a method of forming a micromirror structure, wherein hydrogen plasma treatment and the formation of the second layer are preformed in the same processing chamber (section 0099).

Regarding claim 40, Chinn et al. discloses a method of forming a micromirror structure, wherein the hydrogen treatment is an HF vapor treatment (sections 0075 and 0099).

Regarding claim 41, Chinn et al. discloses a method of forming a micromirror structure, wherein the HF vapor used HF (49wt%) with a ratio of H_2O: HF = 30:1 ~ 70:1 (section 0076).

Regarding claim 42, Huibers et al. discloses a method of forming a micromirror structure, wherein the mirror plate is an ONO (oxide-metal-oxide) layer (col. 7, lines 25-27).

Regarding claim 43, Huibers et al. discloses a method of forming a micromirror structure, wherein the conductive material comprises at least one of W, Mo, Ti, and Ta (col. 9, lines 46-52).

Regarding claim 44, Huibers et al. discloses, in figures 4 and 5A-5C, a method of forming a micromirror structure, comprising the steps of: forming a first sacrificial silicon layer (512) on a substrate (511) (col. 9, lines 4-5); forming a mirror plate (513) on part of the first sacrificial silicon layer (512) (col. 8, lines 53-54 and col. 9, line 5); forming a second sacrificial silicon layer (514) over the mirror plate (513) and the first sacrificial silicon layer (512) (col. 9, lines 10-14); partially etching the first and second sacrificial silicon layers (512 and 514) to create an opening exposing a portion of the mirror plate (513) (figure 5B) and at least one hole (516 and 518) exposing a portion of the substrate (col. 9, lines 23-27); filling a conductive material in the opening (figure 5B) and the hole (516 and 518) to define a mirror support structure (515) attached to the mirror plate (513) and the substrate (511) (col. 9, lines 36-42); and removing the first and second sacrificial layers (512 and 514) to release the mirror plate (513) (col. 9, lines 40-45) except that it does not show performing an inert gas sputtering on the mirror plate and the first sacrificial silicon layer; performing a hydrogen treatment on the first sacrificial silicon layer to form an H-treated silicon surface thereon. Chinn et al. shows that it is known to provide an inert gas sputtering on the mirror plate and the first sacrificial silicon layer; performing a hydrogen treatment on the first sacrificial silicon layer to form an H-treated silicon surface thereon for creating bonded hydroxyl groups on to remove residues (section 0099). Therefore it would have been obvious to someone of ordinary skill in the art at the time the invention was made to combine the method of Huibers et al. with the inert gas and hydrogen treatment of Chinn et al. for the purpose of creating bonded hydroxyl groups on to remove residues (section 0099).

Regarding claim 45, Huibers et al. discloses a method of forming a micromirror structure, wherein the substrate (511) is a glass or quartz substrate (col. 8, lines 40-45).

Regarding claim 46, Huibers et al. discloses a method of forming a micromirror structure, wherein the first sacrificial layer (512) is an amorphous silicon layer or a crystalline silicon layer (col. 8, lines 46-52).

Regarding claim 47, Huibers et al. discloses a method of forming a micromirror structure, wherein the second sacrificial silicon layer (514) is an amorphous silicon layer or a crystalline silicon layer (col. 9, lines 10-14).

Regarding claim 48, Chinn et al. discloses a method of forming a micromirror structure, wherein the second sacrificial silicon layer (514) is formed by CVD using SiH_4 as a reaction gas (section 0075).

Regarding claim 49, Chinn et al. discloses a method of forming a micromirror structure, wherein the inert gas sputtering is argon sputtering (section 0015).

Regarding claim 50, Chinn et al. discloses a method of forming a micromirror structure, wherein the hydrogen treatment is a hydrogen plasma treatment (section 0099).

Regarding claim 51, Chinn et al. discloses a method of forming a micromirror structure, including an RF power, a hydrogen gas flow, an operating temperature, an operating time, and an operating pressure except for the operational conditions of the hydrogen plasma treatment comprise an RF power of 50~300 Watts, a hydrogen gas f low of 200~2000 sccm, an operating temperature of 300~400 ^{0}C, an operating time of 30-90sec and an operating pressure of 0.1~10 torr. It would have been obvious to modify the hydrogen plasma treatment to include an RF power of 50~300 Watts, a hydrogen gas f low of 200~2000 sccm, an operating temperature of

300~400 ^{0}C, an operating time of 30-90sec and an operating pressure of 0.1~10 torr, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 233). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the hydrogen plasma treatment to include an RF power of 50~300 Watts, a hydrogen gas f low of 200~2000 sccm, an operating temperature of 300~400 ^{0}C, an operating time of 30-90sec and an operating pressure of 0.1~10 torr for the purpose of defining a plasma processing system suitable for treatment of the hydrogen (sections 0068, 0082, and 0093).

Regarding claim 52, Chinn et al. discloses a method of forming a micromirror structure, including an RF power, a hydrogen gas flow, an operating temperature, an operating time, and an operating pressure except for the operational conditions of the hydrogen plasma treatment comprise an RF power of 200 Watts, a hydrogen gas f low of 600 sccm, an operating temperature of 320 ^{0}C, an operating time of 60 sec and an operating pressure of 0.8 torr. It would have been obvious to modify the hydrogen plasma treatment to include an RF power of 200 Watts, a hydrogen gas f low of 600 sccm, an operating temperature of 320 ^{0}C, an operating time of 60 sec and an operating pressure of 0.8 torr, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980)). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the hydrogen plasma treatment to include an RF power of 200 Watts, a hydrogen gas f low of 600 sccm, an operating temperature of 320 ^{0}C, an operating time of 60 sec and an operating pressure of 0.8

torr for the purpose of defining a plasma processing system suitable for treatment of the hydrogen (sections 0068, 0082, and 0093).

Regarding claim 53, Chinn et al. discloses a method of forming a micromirror structure, wherein hydrogen plasma treatment and the formation of the second layer are preformed in the same processing chamber (section 0099).

Regarding claim 54, Chinn et al. discloses a method of forming a micromirror structure, wherein the hydrogen treatment is an HF vapor treatment (sections 0075 and 0099).

Regarding claim 55, Chinn et al. discloses a method of forming a micromirror structure, wherein the HF vapor used HF (49wt%) with a ratio of H_2O: HF = 30:1 ~ 70:1 (section 0076).

Regarding claim 56, Huibers et al. discloses a method of forming a micromirror structure, wherein the mirror plate is an ONO (oxide-metal-oxide) layer (col. 7, lines 25-27).

Regarding claim 57, Huibers et al. discloses a method of forming a micromirror structure, wherein the conductive material comprises at least one of W, Mo, Ti, and Ta (col. 9, lines 46-52).

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Rajan et al. (US 2003/0169962 A1) discloses an array of electrostatically tiltable mirrors formed in a MEMS structure.

Huibers et al. (6529310 B1) discloses a spatial light modulator having a substrate holding an array of deflectable (e.g. mirrors) elements.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brandi N Thomas whose telephone number is 571-272-2341. The examiner can normally be reached on 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on 571-272-2328. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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November 1, 2004

Ricky Mack
RICKY MACK
PRIMARY EXAMINER